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The effectiveness of using protein mixed feed in feeding honey bees

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Abstract

The study of effectiveness of the use of protein feeding bees was carried out in the conditions of the apiary ALLC "Volodymyr" in village Shershni Tyvriv district of Vinnytsia oblast. According to the principle of analogous groups were selected bee colonies for the formation of experimental groups. Protein feed was moistened with 50% sugar syrup and filled in the honeycomb. According to the experimental scheme during the preparatory period the bee colonies of the experimental groups II, III and IV were fed a feed mixture in an amount of 25 g per day. According to the experimental scheme during the main period bee colonies were fed a feed mixture of 70 g per day. Accounting of bees brood on the set dates was carried out at the expense of a grid frame every 12 days. Commercial honey was determined by weighing after pumping from each bee colonies separately. Forage honey was determined by weighing the honeycomb and then subtracting the conditional mass of the honeycomb. During the experimental Ukrainian breed bee colonies were involved which they were kept in long hive. Care and maintenance for bee colonies were the same. It was studied the effectiveness of using combined protein feeds in bee feeding. It is proved that in the spring during the harvesting honey use protein feeds (defatted soya flour with soy peptides and pollen) for feeding bees has a positive effect on the brood rearing by bee colonies and the production of honey and wax in the following sequence: defatted soya flour and pollen (50 % + 50 %) defatted soya flour and soy peptides (50 % + 50 %) defatted soya flour (100 %).

Key words: beekeeping, nectariferous plant, defatted soya flour, soy peptides, comb capping, comb foundation, brood rearing.

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1. Introduction

In Ukraine beekeeping is one of the leading branches of animal husbandry. During the last period of formation of agricultural production, a significant number of industries have limited their production capacity due to a significant reduction of resources. Despite the critical situation in the agricultural sector, the beekeeping industry not only hasn't reduced its capacity but on the contrary increased the gross production of medicinal and high-performance products. Although mainly at the expense of the private sector (Taranov, 1987; Polishhuk, & Gajdar, 2008; Drujbiak et al., 2017; Vishchur et al., 2019).

However, today the beekeeping industry is affected from negative natural and climatic factors a high level of chemicalization and institutional economic uncertainty (Ponomar'ova, 1980; Lazarjeva et al., 2017; Jefimenko, 2018).

An increase in the ambient temperature on the background of reduced precipitation, an uncontrolled decrease in nectariferous plant in the conditions of forest lands, chemical protection from pests and weeds of plants and the lack of State protection in the field of beekeeping significantly inhibit its development (Polishhuk, 1975; Razanov et al., 2010; Kosicyn, 2012; Kovalskyi et al., 2018). One of the most significant factors that affects the livelihoods bees and making their products is providing them with sufficient feed (Taranov, 1986; Vishchur et al., 2016; Gucol et al., 2017; Kovalchuk et al., 2019). Therefore, it is known that during the year one bee colony consumes up to 80 kg of carbohydrate and up to 20 kg of protein feed. Insufficient provision of carbohydrate and protein feed to bees negatively affects on their livelihoods and on the amount of products produced. In particular, under these conditions there is a decrease in the development of bee colonies which leads to a decrease in their production of honey, wax, bee pollen, bee bread, royal jelly and another products. At the same time, it is necessary to note the significant departure as bees and bee colonies in winter and the low pollination efficiency (Fedoruk & Romaniv, 2013; Jagich & Losjev, 2020). As a

result the economic efficiency of the beekeeping industry is reduced. It is known that the level feed supply of bee is largely depends on the capacity of the honey-bearing base (Kosicyn, 2010). In the forest-steppe the honey-bearing base is characterized by one that it is incomplete provide bees feed due to the high ploughing of land up to 80 %, especially in the early spring and autumn periods (Komisar, 2005; Jefimenko, 2018).

Consequently, in early spring and at the end of the summer period the intensity of providing bees with high-quality feed is reduced which delays the development of bee families, reduces their productivity and economic efficiency (Verygin, 2010).

Under these conditions, there is a need to restore bee feed stocks with various substitutes for flower feed (Taranov, 1986; Polishhuk, & Gajdar, 2008; Dobrovs'k, 2017).

2. Materials and methods

The study of effectiveness of the use of protein feeding bees was carried out in the conditions of the apiary ALLC "Volodymyr" in village Shershni Tyvriv district of Vinnytsia oblast.

According to the principle of analogous groups were selected bee colonies for the formation of experimental groups.

During the experimental Ukrainian breed bee colonies were involved which they were kept in long hive. Care and maintenance for bee colonies were the same.

The experimental was carried out according to the scheme shown in table 1.

Table 1
Research Scheme

The experimental groups of bee colonies	Number of bees colonies in a group	Features of the period of preparation		Features of the main period	
		duration, days	feed ingredients	duration, days	feed ingredients
I control group	10	6	without feeding	10	without feeding
II experimental group	10	6	100 % defatted soya flour	10	100 % defatted soya flour
III experimental group	10	6	50 % defatted soya flour + 50 % soy peptides	10	50 % defatted soya flour + 50 % soy peptides
IV experimental group	10	6	50 % defatted soya flour + 50 % bees pollen pellet	10	50 % defatted soya flour + 50 % bees pollen pellet

Protein feed was moistened with 50% sugar syrup and filled in the honeycomb. According to the experimental scheme during the preparatory period the bee colonies of the experimental groups II, III and IV were fed a feed mixture in an amount of 25 g per day. According to the experimental scheme during the main period bee colonies were fed a feed mixture of 70 g per day.

Accounting of bees brood on the set dates was carried out at the expense of a grid frame every 12 days.

Commercial honey was determined by weighing after pumping from each bee colonies separately. Forage honey was determined by weighing the honeycomb and then subtracting the conditional mass of the honeycomb.

Determination of wax production by bee families was carried out by weighing the melted honeycomb capping wax from each bee colony separately. Due to the wax production to the reconstruction of comb foundation is determined by counting the number of drawn out honeycombs from comb foundation given that bees produce 70 g of wax for each restored comb foundation frame of 435×300 mm.

3. Results and discussion

Experimental results on the effect of protein substitutes on the intensity of brood rearing showed different efficiency (Table. 2).

Table 2
For the experimental period the brood reared by bee families, cm^2

The bee colonies in the experimental groups	Number of bee colonies in the group	Average number of brood reared for the group on the following dates							
		20.03	1.04	13.04	25.04	6.05	18.05	30.05	average for reference period
I control group	10	1273	1378	1610	2010	3710	4978	5012	2995
II experimental group	10	1250 ± 102	1470 ± 94	1730 ± 107	2180 ± 104	3970 ± 121	5470 ± 118	5421 ± 121	3213
III experimental group	10	1237 ± 112	1930 ± 102	2430 ± 87	2570 ± 103	4535 ± 101	6341 ± 121	7345 ± 113	3769
IV experimental group	10	1261 ± 112	2070 ± 105	2560 ± 108	2950 ± 97	5170 ± 117	7250 ± 111	7932 ± 118	4164

In particular, it was found that in compared to their counterparts in the control group the bee colonies of the second, third and fourth experimental groups reared more brood on the first date by 6.5 %, 40.0 and 50.2 %,on the third date by 7.4 %, 50.1 and 57.0 %, on the fourth date by 8.4 %, 27.8 and 46.7 %, on the fifth date by 7.0 %, 22.2 and 39.3 %, on the sixth date by 98 %, 27.3 and 44.8 %, on the seventh date by 6.8 %, 22.1 and 31.9 %.

The average for the experimental period, bee colonies of the second experimental group fed defatted soya flour reared

of 7.2 % more brood in compared to bee colonies of the control group. In compared to the control group when we used defatted soya flour and soy peptides for feeding bees of the third experimental group was observed to increase in brood rearing by 25.8 % and for feeding defatted soya flour and flower pollen increased by 39.0 %.

Consequently, in the spring during the harvesting honey the bees are feeding with defatted soya flour and pollen that most contributed to the increase in brood rearing in comparison with feeding the bees of defatted soya flour and soy peptides and with feeding defatted soya flour.

Feeding bees with protein substitutes had a positive effect on their honey productivity (Table 3). Thus, the bee colonies of the second experimental group produced commercial and forage honey by 6.0 and 5.2 %, the third experimental group by 12.1 and 52.6 % and the fourth experimental group by 21.2 and 57.8 % more, in compared to their counterparts in the control group.

Table 3
Productivity of Honey Bee Colonies

The experimental groups of bee	Number of bee colonies in the group	Honey production, kg		
		commercial honey	forage honey	gross honey
I control group	10	16.5 ± 1.4	9.5 ± 0.4	26.0
II experimental group	10	17.5 ± 1.2	9.0 ± 0.7	26.5
III experimental group	10	18.5 ± 1.3	14.5 ± 1.2	33.0
IV experimental group	10	20.0 ± 1.0	15.0 ± 1.4	35.0

The bee colonies of II, III and IV experimental groups produced more gross honey by 19.0 %, 26.9 and 34.6 % in compared to their counterparts in the control group.

Analyzing the beeswax productivity, it should be noted that the bee colonies of II, III and IV experimental groups produced more beeswax due to the honey comb capping by 2.4 % 13.2 and 16.5 %, and due to reconstruction of comb foundation by 21.4 % 39.6 and 38.2 % in compared to their counterparts of the control group (Table 4).

Table 4
Wax productivity of bee colonies, on average of groups

The experimental groups of bee	Number of bee colonies in the group	Production of beeswax at the expense of the		
		honey comb capping	reconstruction of comb foundation	gross production
I control group	10	121 ± 17	280 ± 12	401
II experimental group	10	124 ± 21	340 ± 17	464
III experimental group	10	137 ± 16	391 ± 15	528
IV experimental group	10	141 ± 11	387 ± 13	528

The gross beeswax production by bee colonies of II experimental group was higher by 15.7 %, the III – by 31.6 and the IV – by 31.9 % in compared to the control group.

4. Conclusions

The use of combined protein feeds (defatted soya flour with soy peptone and pollen) for feeding bees in the spring during the harvesting honey has a positive effect on the brood rearing by bee colonies and the production of honey and wax in the following sequence: sequence: defatted soya flour and pollen (50 % + 50 %), defatted soya flour and soy peptides (50 % + 50 %), defatted soya flour (100 %).

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